WATER-PERMEABLE CONCRETE PAD AND FORM

Background of the Invention

(1) Field of the Invention

The present invention relates to concrete pads having drainage holes, and in particular to concrete pads made using a form that includes a plurality of spaced, vertically aligned conduits joined by spacers, and having removable caps covering their upper ends.

(2) Description of the Prior Art

Concrete pads, i.e., a layer of poured concrete having a given length, width and thickness, are highly durable and are widely used for a variety of applications including walkways, driveways, and the like. Normally, concrete pads are formed by preparing the surface on which the pad is to be poured, and then constructing a removable form or frame about the periphery of the area.

The interior of the form is then filled with a pourable concrete mix and the upper surface of the poured concrete is leveled with the upper surface of the form, normally by drawing a screed supported by the form over the concrete to remove any excess concrete and to fill any voids. As the concrete sets, the upper surface of the pad can be finished with a float over the surface to form a smooth surface, or brooming the surface to form a brushed surface. The form is then removed after the concrete has cured.

One disadvantage of concrete pads is the fact that water impinging on the pad, e.g., rainwater, is prevented from absorption into the soil beneath the pad, resulting in

runoff that can cause flooding and soil erosion. As a result, the use of concrete pads in sensitive areas may be prohibited.

Two approaches are commonly used to address this problem. First, instead of using on-site formed pads, the area may be covered with revetment pads, which are essentially preformed concrete pads that are produced in a mold having projections that create openings in the pads. Normally, several revetment pads will be placed side-by-side to cover the selected area. This approach is considerably more expensive than pouring a single concrete pad, and provides an inferior covering since the individual pads may shift over time.

The second approach to this problem is to pour the pads with porous concrete instead of conventional concrete. Porous concrete is of limited value in that only a small percentage of water may penetrate the pad, particularly during a hard or heavy rain. In addition, porous concrete is considerably more expensive than conventional concrete.

Thus, there remains a need for a concrete pad that has the attributes of a conventional concrete pad, while still permitting drainage of water through the pad. In particular, the cost of the pad should be comparable to conventional concrete pads, and should permit sufficient water to flow through the pad, even with heavy rainfall.

Summary of the Invention

Generally, the present invention relates to a concrete form of a unique configuration, to a concrete pad incorporating the form in-situ, and to a method of using the concrete form to produce a concrete pad with water drainage holes.

More specifically, the concrete form is comprised of a plurality of spaced vertical conduits that are joined together by spacers. For example, the conduits may be arrayed in a rectangular or diamond-shaped configuration with the conduits being held in a fixed configuration by the spacers. The conduits are of a length that corresponds to the desired thickness of the concrete pad, which is usually about 3 to 6 inches.

The form is manufactured to a standard dimension offsite, e.g., by injection or vacuum molding from a plastic, or by molding from other material such as cardboard. The form may be cut to the desired dimensions and configuration on site, if the size of the desired concrete pad is less than the size of the preformed form. Alternatively, a plurality of forms may be joined together, if the dimensions of the concrete pad are greater than the dimensions of the form.

The conduits include upper ends with removable covers or caps to prevent concrete from entering the conduits during formation of the concrete pad. These caps are removed after the concrete is poured to allow water to flow downwardly through the conduits for absorption into the soil beneath the pad. The caps may be in the form of pull-off caps with optional pull tabs, or may be punch-out caps that can be removed by striking the cap downwardly to break the connection of the cap with the conduit and then removing the cap.

The spacers may be of various configurations so long as the spacer has ends that attach to conduits. Preferably, the spacers are integrally formed with the conduits. The upper surface of the spacers should not project above the upper ends of the

conduits, and will preferably be at a level slightly below the conduit upper ends. The lower surface of the spacers can project above or below the lower ends of the conduits.

The cross-sectional shape of the conduit may be circular, or of various other shapes depending upon the aesthetic appearance desired. For example, the conduit may have a cross-section that is in the shape of a star, a half-moon, a triangle, etc. All of the conduits may have the same cross-sectional configuration, or conduits of different configurations may be combined in a single form. The cross-sectional area of a given conduit may vary. Normally, however, the cross-sectional area will be from about 0.25 to about 2.0 inches, with about 4 to about 100, and more commonly about 6 to about 60 conduits being present in each square foot of form.

The vertical height of the form is not critical to the invention. The vertical height may be, for example, from about 2 to about 6 inches. For instance, most concrete pads are poured to a thickness of about 3.5 inches, referred to in the trade as a 4 inch pad, due to the use of 2X4s as framing lumber. The forms may also be stacked for use in pouring thicker forms. In this application, only the caps on the upper form will be used during pouring of the concrete.

The form may be reinforced prior to formation of the concrete pad by attaching reinforcing rods, or rebar, to the form. The form may include attachment means for this purpose. These attachment means may be in the form of hooks, loops, holes, slots, etc., which will normally be used to attach the reinforcement rod to the form.

In the production of the concrete pad, one or more forms, cut to size if needed, are positioned on a prepared surface, e.g., a generally horizontal surface that has been smoothed to receive the form. The form may be secured in place by anchors that are attached to the form and driven into the ground. If desired, a removable outer frame may be constructed around the form.

Concrete is then poured into the form until the concrete covers the form and is at a level at least up to the upper ends of the conduits. The concrete is then leveled, e.g., with a screed, so that the upper surface of the concrete is in a plane with the upper ends of the conduits. The concrete may then be smoothed with a float and, optionally brushed.

After the concrete has cured, the conduit caps are removed. The resultant concrete pad has all of the attributes of a conventional concrete pad in terms of durability and support for objects placed on the pad. However, due to the conduits, water that falls or flows onto the surface of the pad will be able to drain through the conduits into the soil beneath the pad, eliminating the primary objection to such pads and permitting their use instead of the less desirable and more expensive alternatives.

Brief Description of The Drawings

Fig. 1 is a perspective view of a preferred embodiment of the form of the invention within a removable frame.

Fig. 2 is a perspective view of a concrete pad formed by pouring concrete over the form of Fig. 1.

Fig. 3 is a top view of another embodiment of the form of the invention with the conduits in a diamond-shaped array.

Fig. 4 is a top view of another embodiment of the invention in which the conduits have different cross-sectional shapes.

Fig. 5 is a detailed sectional side view of a part of the form.

Fig. 6 is a detailed top view of the part of the form shown in Fig. 5.

Fig. 7 is a perspective of a segment of a form manufactured by vacuum molding a sheet of plastic.

Fig. 8 is a sectional side view of sections of two stacked forms.

Detailed Description of The Invention

In the following description, terms such as horizontal, upright, vertical, above, below, beneath, and the like, are used solely for the purpose of clarity in illustrating the invention, and should not be taken as words of limitation. The drawings are for the purpose of illustrating the invention and are not intended to be to scale.

As best shown in Fig. 1, a preferred embodiment of form, generally 10, is comprised of a plurality of vertical conduits 12 joined by spacers 14 in a rectangular array. Some of spacers 14 may include attachments 16 for positioning of rebar 18. In the embodiment shown, attachment 16 is a V-shaped slot having a lower end approximately one-half the distance between the upper and lower surfaces of form 10. As shown, form 10 is enclosed within a temporary frame 20, which is removed after the poured concrete has cured.

Fig. 2 illustrates a concrete pad, generally 30, poured using the form illustrated in Fig. 1. The upper ends of conduits 12 of in-situ form 10 are in a plane with the upper surface of pad 30, so that water collected on the upper surface of pad 30 will flow through conduits 12 to be absorbed by the soil beneath pad 30.

Fig. 3 illustrates another form 40, which is similar to form 12, except for the arrangement of conduits 42, which are held in a diamond-shaped array by spacers 44. It will be apparent to one skilled in the art that the conduits can be arrayed in any manner to meet the aesthetic and functional requirements of the user. As shown in Fig. 4, the conduits in either form can also be of various cross-sectional shapes. While most conduits will likely be of a circular cross-section as shown at 50, the conduit may have a triangular cross-section as shown at 52, a half-moon shaped cross-section as shown at 54, a star shaped cross-section as shown at 56, a rectangular cross-section as shown at 58, etc.

Figs. 5 and 6 are detailed views of a part of a form showing sectional views of conduits 12 having upper ends covered by removable caps 60. Caps 60 may have pull tabs 62 to facilitate removal after the concrete has cured. Spacer 14 may include an optional anchor receiver, shown as slot 64 in the upper edge of spacer 14 to receive a ground anchor 66. Alternatively, rebar attachments 16 may be used for this purpose.

Fig. 7 illustrates an alternative form, generally 70, manufactured by vacuum forming a sheet of plastic to create conduits 72 joined by integral spacers 74. The cost to manufacture this form is generally less. In addition, the weight of the concrete on

the form base 76 and on the curvatures 78 at the lower ends of conduits 72 and spacers 74 server to anchor the form in place.

Fig. 8 illustrates forms, generally 80, adapted for vertical stacking to increase the pad thickness. Each form 80 is comprised of conduits 82 having an upper section 84 with a given inner diameter and a lower section 86 with an outer diameter equal to the inner diameter of section 84. As a result, the lower sections 86 of one stack can be inserted into the upper sections 84 of another form to increase the form height. Spacers 88 join conduits 82. Other configurations to render the forms stackable with become apparent to one skilled in the art. For examples, a locking member can be used to attach the upper edge of a spacer of one form to the lower side of a spacer of another form.

Referring to Figs. 1 and 2, in the method of the present invention, form 10 is positioned in the desired location on the ground. A temporary frame 20 may be positioned around form 10. The form may be reinforced by attaching rebar 18 to spacers 14. Form 10 may be secured in place by anchors 66. Concrete is then poured into form 10 and leveled so that the upper surface of the concrete is in a plane with the upper ends of conduits 12. After the concrete has cured, conduit caps 60 are removed so that any water that falls or flows onto the surface of pad 30 can escape through conduits 12 into the soil beneath the pad.

Certain modifications and improvements will occur to those skilled in the art upon a reading of the foregoing description. It should be understood that all such

modifications and improvements have been deleted herein for the sake of conciseness and readability but are properly within the scope of the following claims.